**General Specifications**

| Item | Specification |
|---|---|
| Cooling System Capacity | 15.2 L (4.0 gal) |
| **Coolant Type** | |
| Motorcraft Premium Gold Engine Coolant VC-7-A in (Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |
| **Other Chemicals** | |
| Motorcraft Premium Cooling System Flush VC-1 | ESR-M14P7-A |
| Premium Long Life Grease XG-1-C | ESA-M1C75-B |
| Cooling System Stop Leak Pellets VC-6 | ESE-M99B37-B5 except as noted in ES-F65E-19A511-AA |
| Gasket Adhesive TA-6 | WSS-M2G408-A |
| Cooling System Pressure Test Specifications | 138 kPa (20 psi) |
| Radiator Cap Pressure Test Specifications | 110 kPa (16 psi) |
| **Thermostat Opening Temperatures** | |
| Starts to open (4.6L 2V) | 87-93°C (192-199°F) |
| Starts to open (3.8L) | 86.7-90.6°C (189-196°F) |
| Starts to open (Cobra) | 80-83°C (175-182°F) |
| Fully open | 104°C (219°F) |

**Torque Specifications**

| Description | Nm | lb-ft | lb-in |
|---|---|---|---|
| Accelerator cable bracket bolts | 10 | — | 89 |
| Cylinder block drain plug | 20 | 15 | — |
| Exhaust manifold to EGR valve tube nut | 35 | 26 | — |
| Fan shroud bolts | 10 | — | 89 |
| Fan motor bolts | 10 | — | 89 |
| Degas bottle nuts | 10 | — | 89 |
| Coolant expansion tank bracket bolts | 10 | — | 89 |
| Radiator support bracket bolts | 30 | 22 | — |
| Transmission fluid cooler fittings | 30 | 22 | — |
| Coolant outlet connection bolts (3.8L) | 10 | — | 89 |
| Bypass tube bracket bolts (3.8L) | 10 | — | 89 |
| Bypass tube bolts (4.6L) | 10 | — | 89 |
| Bypass tube nuts (Supercharged engine) | 25 | 18 | — |
| Coolant hose mounting bolt | 25 | 18 | — |

| | | | |
|---|---|---|---|
| Intake manifold bolts | 10 | — | 89 |
| Supercharger drive belt cover | 10 | — | 89 |
| Thermostat housing bolts | 10 | — | 89 |
| Vacuum accessory bracket fasteners | 10 | — | 89 |
| Coolant outlet connection bolts (4.6L 2V) | 25 | 18 | — |
| Coolant outlet connection bolts (4.6L 4V) | 10 | — | 89 |
| Coolant pump bolts (3.8L) | 28 | 21 | — |
| Coolant pump bolts (4.6L) | 25 | 18 | — |
| Coolant pump pulley bolts | 25 | 18 | — |
| Air intake scoop bolts | 25 | 18 | — |
| Air intake scoop bracket bolt | 25 | 18 | — |
| Air intake scoop bracket nuts | 25 | 18 | — |
| Air intake scoop bracket throttle body nut | 9 | — | 80 |
| Exhaust gas recirculation (EGR) vacuum regulator solenoid bolts | 10 | — | 89 |

# Engine Cooling

**CAUTION: Vehicle cooling systems are filled with Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.**

**NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

The 4.6L cooling system components include the:

- block heater
- engine coolant temperature (ECT) sensor
- fan blade, fan motor and fan shroud assembly
- radiator
- pressure relief cap
- radiator draincock
- coolant pump
- coolant thermostat
- oil filter adapter
- radiator overflow hose
- upper radiator hose
- lower radiator hose

The radiator overflow hose circulates the coolant.

The coolant thermostat:

- controls the engine coolant temperature.
- allows for quicker engine warm-up.

The degas bottle/coolant expansion tank:

- provides a location for service fill.
- contains coolant expansion and system pressurization.
- provides air separation during operation.
- replenishes the engine coolant to the system.

The engine coolant flows:

- from the lower radiator hose to the coolant pump.
- from the coolant pump to the engine block and the cylinder heads.

The 3.8L cooling system components include the:

- block heater
- engine coolant temperature (ECT) sensor
- fan blade, fan motor and fan shroud assembly
- radiator
- radiator cap
- radiator draincock
- coolant pump
- coolant thermostat
- oil filter adapter
- radiator overflow hose
- coolant expansion tank
- upper radiator hose
- lower radiator hose

The fan blade draws air through the radiator to help cool the engine coolant.

The fan motor:

- operates only when the ignition switch is in the RUN position.
- will not operate with the switch in the OFF position.

The engine coolant:

- flows through the radiator tubes and is cooled by passing air over the cooling fins.
- is then circulated from the radiator outlet tank through the coolant pump and into the cylinder block to complete the circuit.

A closed coolant thermostat returns the engine coolant to the coolant pump. An open coolant thermostat allows the engine coolant to flow to the radiator.

**CAUTION: Engine coolant provides freeze protection, boil protection, cooling efficiency, and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle (4.6L) or coolant expansion tank (3.8L).**

When adding engine coolant, use a 50/50 mixture of engine coolant and deionized water.

To maintain the integrity of the coolant and the cooling system:

- **NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

  Add Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that is present in the cooling system. Do not mix coolant types.
- Do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant VC-2 or equivalent

meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.

- Do not add alcohol, methanol, or brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.
- Do not mix with recycled coolant unless it meets the requirements of Ford specification WSS-M97B51-A1. Not all coolant recycling processes meet these Ford specifications. Use of such coolants can harm the engine and cooling system components.

The coolant temperature sensor (4.6L) or cylinder head temperature sensor (3.8L) provides a signal to the temperature gauge.

The optional block heater:

- electrical heating element is installed in the core plug opening.
    - uses a standard 110V electrical supply
- keeps the engine coolant warm during cold weather.

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# Engine Cooling

**Special Tool(s)**

| | |
|---|---|
| ST1474-A | Pressure Tester<br>014-R1072 or equivalent |
| ST1137-A | 73III Automotive Meter<br>105-R0057 or equivalent |
| ST2332-A | Worldwide Diagnostic System (WDS)<br>418-F224,<br><br>New Generation STAR (NGS) Tester<br>418-F052, or equivalent scan tool |
| ST1720-A | Battery/Anti-Freeze Tester<br>014-R1060 or equivalent |

**Inspection and Verification**

**WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine is cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth).**

**CAUTION: Check the coolant level, engine oil and transmission fluid, top off the coolant if needed. If there is engine coolant in the engine oil or transmission fluid, the cause must be corrected and oil/fluid changed or major component damage may occur.**

1. Verify the customer's concern by operating the engine to duplicate the condition.
2. Inspect to determine if any of the following mechanical or electrical concerns apply.

**Visual Inspection Chart**

| Mechanical |
| --- |
| • Leaks<br>• Hoses<br>• Hose clamps<br>• Water gasket<br>• Head gaskets<br>• Intake manifold gasket<br>• Coolant pump<br>• Radiator<br>• Degas bottle/coolant expansion tank<br>• Heater core<br>• Fan/fan clutch<br>• Engine coolant temperature sensor (4.6L)<br>• Cylinder head temperature sensor (3.8L)<br>• Circuitry |

3. If the inspection reveals an obvious concern that can be readily identified, repair as necessary.

4. **CAUTION: Some vehicle cooling systems are filled with Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.**

   **NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

   Inspect the coolant condition.
   1. Inspect the coolant color.
      - If Motorcraft Premium Gold Engine Coolant (yellow color) VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 has a clear or pale yellow color, this indicates higher water content than required.
      - Dark brown can indicate unauthorized stop leak may have been used. Use Motorcraft Cooling System Stop Leak Pellets VC-6 or equivalent meeting Ford specification ESE-M99B37-5 except as noted in ES-F6SE-19A511-AA only.
      - A light or reddish brown color indicates that rust may be present in the cooling system. Flush the system and refill with the correct mixture of water and engine coolant.
      - An iridescent sheen on top of the coolant can indicate a trace of oil is entering the system. For additional information on engine diagnosis, refer to Section 303-00 .
      - A milky brown color may indicate that either engine oil or transmission fluid is entering the cooling system. If transmission fluid is suspected, the cause may be a leaky radiator. Pressure test the cooling system. For additional information, refer to component tests in this section. If engine oil is suspected the cause of the leak may be internal to the engine. For additional information, refer to Section 303-00 .
   2. If the engine coolant appearance is acceptable, test the engine coolant freezing point range with the battery and anti-freeze tester. The freezing point should be in the range -40°C to -20°C (-50°F to -10°F). If the vehicle is driven in cold climates less than -32°C (-34°F), it may be necessary to increase the coolant concentration to get adequate freeze protection.
      - Maximum coolant concentration is 60% coolant/40% water.
      - Minimum coolant concentration is 40% coolant/60% water.
   3. Adjust coolant range and level, if necessary:

- If coolant is low, add specified coolant mixture only.
- If the engine coolant tests too weak, add straight engine coolant until the readings are within acceptable levels.
- If the engine coolant tests strong, remove some of the engine coolant and add water until the readings are within acceptable levels.

5. If the concern remains after the inspection, determine the symptom(s) and GO to Symptom Chart

**Symptom Chart**

**Symptom Chart**

| Condition | Possible Sources | Action |
|---|---|---|
| • Loss of coolant | • Radiator.<br>• Coolant pump seal.<br>• Radiator hoses.<br>• Heater hoses.<br>• Heater core.<br>• Engine gaskets.<br>• Degas bottle or coolant expansion tank. | • Go To Pinpoint Test A . |
| • The engine overheats | • Thermostat.<br>• Coolant pump.<br>• Internal engine coolant leak.<br>• Radiator.<br>• Cooling fan.<br>• Pressure relief cap or radiator cap. | • Go To Pinpoint Test B . |
| • The engine does not reach normal operating temperature | • Thermostat. | • Go To Pinpoint Test C . |

**Pinpoint Tests**

## PINPOINT TEST A: LOSS OF COOLANT

| Test Step | Result / Action to Take |
|---|---|
| **A1 CHECK THE ENGINE COOLANT LEVEL** | |
| **WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine is cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back** | **Yes**<br>GO to A2 .<br><br>**No**<br>REFILL the engine coolant as necessary.<br>GO to A2 . |

| | |
|---|---|
| **while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth).**<br>**NOTE:** Allow the engine to cool before checking the engine coolant level.<br>● Key in OFF position.<br>● Visually check the engine coolant level at the degas bottle or coolant expansion tank.<br>● **Is the engine coolant level within specification?** | |
| **A2 CHECK THE PRESSURE RELIEF CAP**<br>● Carry out the Cap—3.8L or Cap—4.6L test. Go to Component Tests in this section.<br>● **Is pressure relief cap/radiator cap OK?** | **Yes**<br>GO to A3 .<br><br>**No**<br>INSTALL a new pressure relief cap/radiator cap. TEST the system for normal operation. |
| **A3 CHECK THE ENGINE COOLANT FOR INTERNAL LEAK**<br>● Key in OFF position.<br>● Inspect the engine coolant in degas bottle/coolant expansion tank for signs of transmission fluid or engine oil.<br>● **Is oil or transmission fluid evident in the coolant?** | **Yes**<br>If engine oil is evident, REFER to Section 303-00 . If transmission fluid is evident, REPAIR or INSTALL a new radiator as necessary.<br><br>**No**<br>GO to A4 . |
| **A4 CHECK THE ENGINE AND THE TRANSMISSION FOR COOLANT**<br>● Remove the oil level dipstick from the engine and the transmission.<br>● **Is coolant evident in the oil or transmission fluid?** | **Yes**<br>If coolant is in engine, REFER to Section 303-00 . If coolant is in transmission, REPAIR or INSTALL a new radiator as necessary. To repair the automatic transmission, REFER to Section 307-01 .<br><br>**No**<br>GO to A5 . |
| **A5 PRESSURE TEST THE ENGINE COOLING SYSTEM**<br>● Pressure test the engine cooling system. Go to Component Tests in this section.<br>● **Does the engine cooling system leak?** | **Yes**<br>REPAIR or install new components. TEST the system for normal operation.<br><br>**No**<br>The cooling system is operational. GO to Symptom Chart . |

# PINPOINT TEST B: THE ENGINE OVERHEATS

| Test Step | Result / Action to Take |
|---|---|
| **B1 CHECK THE ENGINE COOLANT LEVEL** | |
| **WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine is cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth). NOTE:** If the engine is hot, allow the engine to cool before proceeding.<br>● Key in OFF position.<br>● Check the engine coolant level at the degas bottle/coolant expansion tank.<br>● **Is the engine coolant OK?** | **Yes**<br>GO to B2 .<br><br>**No**<br>REFILL the engine coolant at the degas bottle/coolant expansion tank. Go To Pinpoint Test A . |
| **B2 CHECK THE COOLANT CONDITION** | |
| ● Check the coolant for dirt, rust or contamination.<br>● **Is the coolant condition OK?** | **Yes**<br>GO to B3 .<br><br>**No**<br>FLUSH the engine cooling system. REFER to Engine and Radiator Flushing in this section. TEST the system for normal operation. |
| **B3 CHECK FOR AN AIRFLOW OBSTRUCTION** | |
| ● Inspect the A/C condenser core and radiator for obstructions such as leaves or dirt.<br>● **Is there an obstruction?** | **Yes**<br>REMOVE the obstruction. CLEAN the A/C condenser core and radiator. TEST the system for normal operation.<br><br>**No**<br>GO to B4 . |
| **B4 CHECK THE WATER THERMOSTAT OPERATION** | |
| ● Start the engine and allow the engine to run for ten minutes.<br>● Feel the inlet and outlet heater water hoses and the underside of the upper radiator hose.<br>● **Are the upper radiator hose and the heater water hoses cold?** | **Yes**<br>INSTALL a new water thermostat. REFER to Thermostat—3.8L , Thermostat—4.6L(2V) or Thermostat—4.6L (4V) in this section. TEST the system for normal operation.<br><br>**No**<br>GO to B5 . |

| B5 CHECK THE COOLING FAN OPERATION | |
|---|---|
| • Carry out the cooling fan component tests. Go to Component Tests.<br>• **Is the cooling fan operation OK?** | **Yes**<br>For diagnosis and testing of the engine, REFER to Section 303-00 .<br><br>**No**<br>INSTALL a new fan component as necessary. TEST the system for normal operation. |

## PINPOINT TEST C: THE ENGINE DOES NOT REACH NORMAL OPERATING TEMPERATURE

| Test Step | Result / Action to Take |
|---|---|
| **C1 CHECK THE ENGINE TEMPERATURE** | |
| • Start the engine and allow the engine to idle for ten minutes.<br>• Feel the inlet and heater water hoses and the underside of the upper radiator hose.<br>• **Are the upper radiator hose and the heater water hoses cold?** | **Yes**<br>INSTALL a new water thermostat. REFER to Thermostat—3.8L , Thermostat—4.6L(2V) or Thermostat—4.6L(4V) in this section. TEST the system for normal operation.<br><br>**No**<br>For diagnosis and testing of the engine coolant temperature gauge, REFER to Section 413-01 . |

**Component Tests**

**Pressure Test — 3.8L**

**WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine is cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth).**

1. Remove the radiator cap. Fill the radiator as needed. Fit the pressure tester to the radiator neck, using an aftermarket adapter.

2. **CAUTION: Do not pressurize the cooling system beyond 110 kPa (16 psi).**

   Pump the cooling system to a maximum of 102 kPa (14.9 psi) and hold for 2 minutes. If the pressure drops within this time, inspect for leaks and repair as necessary.

**Pressure Test — 4.6L**

1. Turn the engine OFF.

2. **WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine is cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth).**

   Check the engine coolant level; refer to Cooling System Draining, Filling and Bleeding in this section.

3. Connect Radiator Heater Core Pressure Tester to the degas bottle nipple and vent hose. Install a pressure test pump to the quick-connect fitting of the test adapter.

4. **CAUTION: Do not pressurize the cooling system beyond 152 kPa (22 psi).**

   **NOTE:** If the plunger of the pump is depressed too quickly, an erroneous pressure reading will result.

   Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained.

5. If the pressure relief cap does not hold pressure, remove and wash the pressure relief cap in clean water to dislodge all foreign particles from the gaskets. Check the sealing surface in the filler neck.

6. If 110 kPa (16 psi) cannot be reached, install a new pressure relief cap. If more than 124 kPa (18 psi) shows on gauge, install a new pressure relief cap.

7. **CAUTION: If the pressure drops, check for leaks at the engine-to-heater core hoses, engine-to-radiator hoses, water valve hose (if applicable), oil cooler return tube gasket (6N789), radiator and heater core or other system components and connections. Any leaks which are found must be corrected and the system rechecked.**

   Pressurize the engine cooling system as described in Step 4 (using a pressure relief cap that operates within the specified upper and lower pressure limits). Observe the gauge reading for approximately two minutes; refer to General Specifications. Pressure should not drop during this time.

8. Release the system pressure by loosening the pressure relief cap. Check the engine coolant level and replenish, if necessary, with the correct engine coolant mixture; refer to Cooling System Draining, Filling and Bleeding in this section.

**Cap — 3.8L**

1. Inspect the radiator cap and seals for damage or deterioration. Install a new radiator cap if necessary.

2. Fit the radiator cap to Radiator/Heater Core Pressure Tester Kit, using the aftermarket adapter.

3. **NOTE:** If the plunger of the pressure tester is depressed too fast, an incorrect pressure reading will result.

   Slowly pump the pressure tester until the pressure gauge stops increasing and note the highest

pressure reading. Release pressure and repeat the test. Install a new radiator cap if the pressure is not 99.3-121.4 kPa (14.4-17.6 psi).

**Cap — 4.6L**

**WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine is cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth).**

1. Remove the pressure relief cap from the degas bottle.
2. Follow the instructions from the pressure tester.
3. **NOTE:** If the plunger of the pump is depressed too quickly, an erroneous pressure reading will result.

   Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained.
4. If the pressure test gauge readings are not within specifications, install a new pressure relief cap. If the pressure test gauge readings are within specifications, carry out the cooling system Pressure Test.

**Thermostat — Water**

A new water thermostat should be installed only after the following electrical and mechanical tests have been carried out.

**Thermostat — Electrical Test**

**CAUTION: Always vent the exhaust to the outside when carrying out this test.**

**NOTE:** The electrical thermostat test is most accurate if carried out at less than 37.8°C (100°F) ambient air. This test may be carried out with or without the hood open and with the engine warm or cold.

1. Check the engine coolant level. Fill as needed.
2. With the ignition OFF, remove the engine coolant temperature (ECT) (4.6L) or cylinder head temperature (CHT) (3.8L) sensor harness connector and attach ECT (4.6L) or CHT (3.8L) Sensor "T" Cable as a jumper between the powertrain control module (PCM) (12A650) and the ECT (4.6L) or CHT (3.8L) sensor. Attach the 73III Automotive Meter to the ECT (4.6L) or CHT (3.8L) Sensor "T" Cable. Voltage values (0-5 V) may now be monitored while the sensor retains its connection to the wiring harness.
   An appropriate diagnostic tool may be used to monitor the ECT on vehicles equipped with data link connector (DLC).

3. **NOTE:** Running this test with the vehicle in gear or with the A/C compressor clutch engaged (running) will cause incorrect diagnosis.

   Place the transmission in PARK (P) or NEUTRAL (N).

4. Start the engine and allow the engine to idle throughout this test. Allow the engine to run for 2 minutes, then record the ECT (4.6L) or CHT (3.8L) voltage. Record the ECT (4.6L) or CHT (3.8L) voltage every 60 seconds. When the ECT (4.6L) or CHT (3.8L) voltage trend changes direction or only changes slightly (0.03 volts or less) from the previous reading, record this as the thermostat opening voltage. Use the voltage and corresponding coolant temperature chart listed below for 4.6L engines only.

| Coolant Temperature °C (°F) | ECT (Volts) |
|---|---|
| 22 (71) | 3.00 |
| 43 (109) | 2.01 |
| 71 (159) | 1.01 |
| 82 (180) | 0.75 |
| 91 (195) | 0.059 |
| 97 (206) | 0.050 |
| 105 (221) | 0.040 |

5. If the thermostat opening voltage is greater than 0.75 volts and less than 82°C (180°F), install a new water thermostat.

6. If the thermostat opening voltage is less than 0.75 volts and greater than 82°C (180°F), the water thermostat is good and a new water thermostat should not be installed. GO to Symptom Chart for further instructions.

**Thermostat — Mechanical Test**

1. Remove the water thermostat.

2. Check the water thermostat for seating. Hold the water thermostat up to a lighted background. Leakage of light around the thermostat valve at room temperature indicates that a new water thermostat should be installed. Some water thermostats have a small leakage notch at one location on the perimeter of the thermostat valve, which is considered normal.

3. Immerse the water thermostat in a boiling coolant and water mixture.

4. See the General Specifications chart for water thermostat opening temperatures.

**Radiator Leak Test, Removed From the Vehicle**

**CAUTION: Never leak test an aluminum radiator in the same water that copper/brass radiators are tested in. Flux and caustic cleaners may be present in the cleaning tank and they will damage aluminum radiators.**

**NOTE:** Always install plugs in the oil cooler fittings before leak-testing or cleaning any radiator.

**NOTE:** Clean the radiator before leak-testing to avoid contamination of tank.

1. Leak-test the radiator in clean water with 138 kPa (20 psi) air pressure.

**Fan — Electric Test**

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

# Cooling System Draining, Filling and Bleeding

**Material**

| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

**Draining**

**WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine is cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth).**

**CAUTION: The coolant must be recovered in a suitable, clean container for reuse. If the coolant is contaminated, it must be recycled or disposed of correctly.**

**NOTE:** Less than 80% of coolant capacity can be recovered with the engine in the vehicle. Dirty, rusty or contaminated coolant should be drained and filled with new coolant.

1. Release the pressure in the cooling system by slowly turning the pressure relief cap one half turn counterclockwise or the radiator cap counterclockwise to the first stop. When the pressure is released, remove the pressure relief cap/radiator cap.

2. Place a suitable container below the radiator draincock. If equipped, disconnect the coolant return hose at the fluid cooler. Open the draincock and drain the engine coolant.
    - Close the radiator draincock.

**Filling — 3.8L**

**CAUTION: Vehicle cooling systems are filled with Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.**

**CAUTION: Engine coolant provides freeze protection, boil protection, cooling efficiency, and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.**

**When adding engine coolant, use a 50/50 mixture of engine coolant and deionized water.**

**To maintain the integrity of the coolant and the cooling system:**

- **Add Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that was drained from the cooling system. Do not mix coolant types.**
- **Do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant VC-2 or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.**
- **Do not add alcohol, methanol, or brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.**
- **Do not mix with recycled coolant unless it meets the requirements of Ford specification WSS-M97B51-A1. Not all coolant recycling processes meet these Ford specifications. Use of such coolants can harm the engine and cooling system components.**

**NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

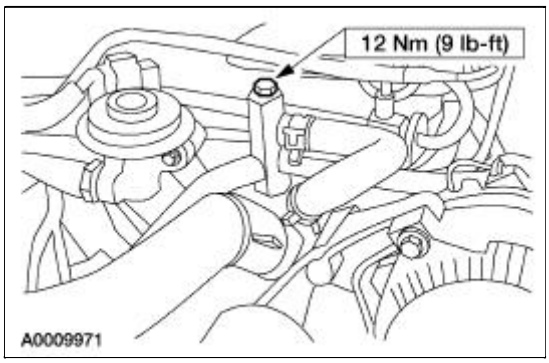
1. Place the heater temperature selector in the maximum cool position.

2. **CAUTION: On 3.8L engines, the vent plug must be removed before radiator fill or the engine may not fill completely.**

   **NOTE:** It is important to maintain engine coolant concentrate between 40 percent or -24°C (-11° F) and 60 percent or -52°C (-62°F).

   Fill the engine cooling system with 50/50 mixture of water and engine coolant.

3. After filling the engine cooling system, add coolant to the vent until full. Install the vent plug.




4. Leave the pressure relief cap off and run the engine until it reaches normal operating temperature.

5. Stop the engine and add the correct engine coolant mixture to the degas bottle/coolant expansion tank until the coolant level is between the COOLANT FILL LEVEL marks.

6. Turn the engine off and allow the cooling system to cool. Check the level in the degas bottle/coolant expansion tank, and add a 50/50 mix as needed.

**Filling — 4.6L (2V)**

**CAUTION: Vehicle cooling systems are filled with Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.**

**CAUTION: Engine coolant provides freeze protection, boil protection, cooling efficiency, and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.**

**When adding engine coolant, use a 50/50 mixture of engine coolant and deionized water.**

**To maintain the integrity of the coolant and the cooling system:**

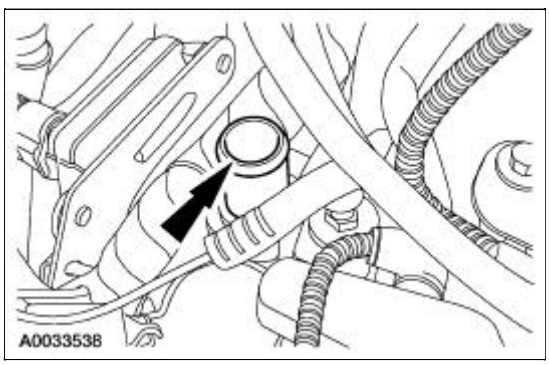
- **Add Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that was drained from the cooling system. Do not mix coolant types.**
- **Do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant VC-2 or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.**
- **Do not add alcohol, methanol, or brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.**
- **Do not mix with recycled coolant unless it meets the requirements of Ford specification WSS-M97B51-A1. Not all coolant recycling processes meet these Ford specifications. Use of such coolants can harm the engine and cooling system components.**

**NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

1. Remove the thermostat. For additional information, refer to Thermostat—4.6L(2V) in this section.

2. Disconnect the heater core coolant supply hose from the fitting at the rear of the manifold.

3. Add the coolant/water mixture through the thermostat opening until coolant appears at the heater core coolant supply outlet fitting at the rear of the manifold.




4. Install the heater hose, using an appropriately sized worm style clamp in place of the constant tension clamp.

5. Reinstall the thermostat gasket (O-ring) and the thermostat. For additional information, refer to Thermostat—4.6L(2V) in this section.

6. Add the correct engine coolant mixture to the degas bottle until the coolant level is between the

"COOLANT FILL LEVEL" marks and replace the pressure cap.

7. Select the maximum cool temperature setting.

8. Run the engine until it reaches operating temperature.

9. **CAUTION: If the engine coolant temperature gauge does not move, the engine coolant level in the engine is low and must be filled. Stop the engine, allow it to cool and fill the cooling system.**

   Add the correct engine coolant mixture to the degas bottle until the coolant level is between the "COOLANT FILL LEVEL" marks.

10. Repeat the two previous steps until the engine coolant mixture is between the "COOLANT FILL LEVEL" marks on the degas bottle. Turn off the engine and allow it to cool.

11. Check the freeze protection of the engine coolant mixture with the Battery/Anti-freeze Tester 014-R1060 or equivalent. Adjust freezing point range if necessary.

**Filling — Cobra**

**CAUTION: Vehicle cooling systems are filled with Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.**

**CAUTION: Engine coolant provides freeze protection, boil protection, cooling efficiency, and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.**

**When adding engine coolant, use a 50/50 mixture of engine coolant and deionized water.**

**To maintain the integrity of the coolant and the cooling system:**

- **Add Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that was drained from the cooling system. Do not mix coolant types.**
- **Do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant VC-2 or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.**
- **Do not add alcohol, methanol, or brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.**
- **Do not mix with recycled coolant unless it meets the requirements of Ford specification WSS-M97B51-A1. Not all coolant recycling processes meet these Ford specifications. Use of such coolants can harm the engine and cooling system components.**

**NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

1. Check all hose clamps for correct tightness. Make sure the radiator draincock is closed.

2. Place the heater temperature selector in maximum cool position.

3. Remove the pressure cap from the cooling system reservoir and the fill plug from the engine crossover tube.

4. **CAUTION: Do not fill the cooling system through the reservoir only. Coolant will not enter the engine. Only the reservoir and the radiator will be filled and engine overheating will occur.**

   Add coolant into the fill neck on the engine crossover tube until coolant reaches the top of the fill neck on the cooling system reservoir.

5. Install the cooling system pressure cap on the reservoir.

6. Continue to fill the cooling system at the engine crossover fill neck until full.

7. Install the engine crossover tube fill plug.

8. **WARNING: To avoid the possibility of personal injury or damage to the vehicle, do not operate the engine with the hood open until the fan has been first examined for possible cracks and separation.**

   **CAUTION: If the engine temperature gauge does not move, coolant level is low in the engine and must be filled. Stop the engine, allow to cool, and fill the cooling system as outlined.**

   Run the engine until the thermostat opens (coolant flowing through the radiator lower hose becomes hot).

9. Stop the engine and allow to cool.

10. Add coolant to the engine crossover tube fill neck until the cooling system is full.

11. Install the fill plug.

12. Repeat the fill procedure if necessary.

**Filling — Mach I**

**CAUTION: Vehicle cooling systems are filled with Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.**

**CAUTION: Engine coolant provides freeze protection, boil protection, cooling efficiency, and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.**

**When adding engine coolant, use a 50/50 mixture of engine coolant and deionized water.**

**To maintain the integrity of the coolant and the cooling system:**

- **Add Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that**

**was drained from the cooling system. Do not mix coolant types.**

- **Do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant VC-2 or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.**
- **Do not add alcohol, methanol, or brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.**
- **Do not mix with recycled coolant unless it meets the requirements of Ford specification WSS-M97B51-A1. Not all coolant recycling processes meet these Ford specifications. Use of such coolants can harm the engine and cooling system components. Do not mix coolant types**

**NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

1. Remove the air intake scoop. For additional information, refer to Section 303-12 .
2. Check all hose clamps for correct tightness. Make sure the radiator draincock is closed.
3. Place the heater temperature selector in maximum cool position.
4. Remove the pressure cap from the cooling system reservoir and the fill plug from the engine crossover tube.
5. **CAUTION: Do not fill the cooling system through the reservoir only. Coolant will not enter the engine. Only the reservoir and the radiator will be filled and engine overheating will occur.**

   Add coolant into the fill neck on the engine crossover tube until coolant reaches the top of the fill neck on the cooling system reservoir.
6. Install the cooling system pressure cap on the reservoir.
7. Continue to fill the cooling system at the engine crossover fill neck until full.
8. Install the engine crossover tube fill plug.
9. **WARNING: To avoid the possibility of personal injury or damage to the vehicle, do not operate the engine with the hood open until the fan has been first examined for possible cracks and separation.**

   **CAUTION: If the engine temperature gauge does not move, coolant level is low in the engine and must be filled. Stop the engine, allow to cool, and fill the cooling system as outlined.**

   Run the engine until the thermostat opens (coolant flowing through the radiator lower hose becomes hot).
10. Stop the engine and allow to cool.
11. Add coolant to the engine crossover tube fill neck until the cooling system is full.
12. Install the fill plug.
13. Repeat the fill procedure if necessary.

14. Install the air intake scoop. For additional information, refer to Section 303-12 .

**Bleeding**

1. Select the maximum heater temperature and blower motor speed settings. Position the control to discharge air at A/C vents in instrument panel.

2. Start the engine and allow to idle. While engine is idling, feel for hot air at A/C vents.

3. **CAUTION: If the air discharge remains cool and the engine coolant temperature gauge does not move, the engine coolant level is low and must be filled. Stop the engine, allow the engine to cool and fill cooling system.**

   Start the engine and allow it to idle until normal operating temperature is reached. Hot air should discharge from A/C vents. The engine coolant temperature gauge should maintain a stabilized reading in the middle of the NORMAL range. The upper radiator hose should feel hot to the touch.

4. Shut the engine off and allow the engine to cool.

5. Check the engine for coolant leaks.

6. Check the engine coolant level in the degas bottle/coolant expansion tank and fill as necessary.

# Engine and Radiator Flushing

**Special Tool(s)**

| | |
|---|---|
| ST2421-A | Coolant System Drain/Flush/Fill 164-R3673 or equivalent |
| ST1168-A | Flush Kit 164-R3658 or equivalent |
| ST1167-A | Drain Kit 164-R3662 or equivalent |

**Material**

| Item | Specification |
|---|---|
| Motorcraft Premium Cooling System Flush VC-1 or equivalent | ESR-M14P7-A |
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

1. **WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth).**

   Once pressure is released, remove the pressure relief cap/radiator cap.

2. Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

3. Remove the coolant thermostat. For additional information, refer to Thermostat—3.8L , Thermostat—4.6L(2V) or Thermostat—4.6L(4V) in this section.

4. Install the coolant hose connection without the thermostat.

5. **NOTE:** Refer to the cooling system flusher manufacturer's operating instructions for specific vehicle hook-up.

   **NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

   Using an appropriate cooling system flusher, flush the engine and radiator.
   Use Ford Premium Cooling System Flush VC-1 or equivalent meeting Ford specification ESR-M14P7-A. Always flush the cooling system with water thoroughly after using the VC-1 flush and prior to filling the cooling system with the same coolant that was present in the system. Do not mix coolant types.

6. Install the thermostat.

7. Backflush the heater core. For additional information, refer to Heater Core Backflushing in this section.

8. Fill the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

# Heater Core Backflushing

**Special Tool(s)**

| | |
|---|---|
| ST1168-A | Flush Kit<br>164-R3658 or equivalent |
| ST1167-A | Drain Kit<br>164-R3662 or equivalent |

**Material**

| Item | Specification |
|---|---|
| Motorcraft Premium Cooling System Flush<br>VC-1 or equivalent | ESR-M14P7-A |
| Motorcraft Premium Gold Engine Coolant<br>VC-7-A (in Oregon VC-7-B)<br>(yellow color) | WSS-M97B51-A1 |

1. **WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine is cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, turn and remove the pressure relief cap (still with a cloth).**

   Once pressure is released, remove the pressure relief cap.

2. Partially drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

3. **NOTE:** For additional information, refer to the cooling system flusher manufacturer's operating instructions for particular vehicle hook-up.

   Use an appropriate cooling system flusher to backflush the heater core. Use Motorcraft Cooling System Flush VC-1 or equivalent meeting Ford specification ESR-M14P7-A. Flush with water thoroughly after using VC-1 or equivalent prior to refilling the cooling system

4. Fill the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

# Thermostat —3.8L

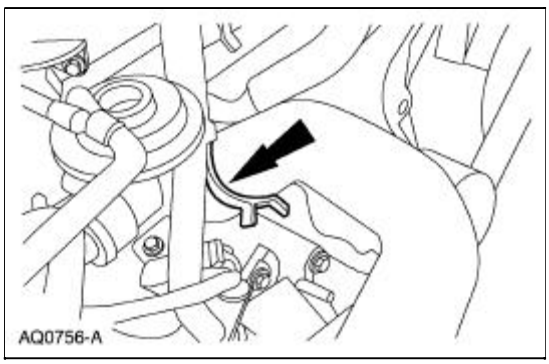
**Material**

| Item | Specification |
|---|---|
| Gasket Adhesive TA-6 or equivalent | WSS-M2G408-A |
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

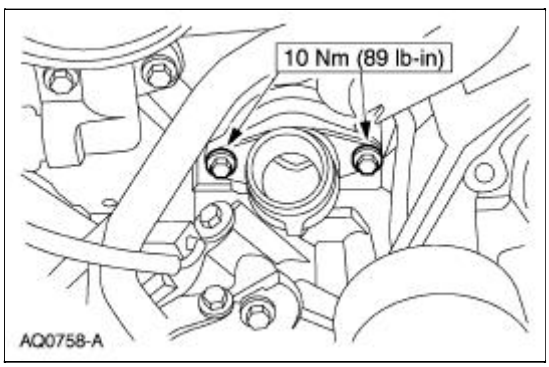
**Removal and Installation**

1. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

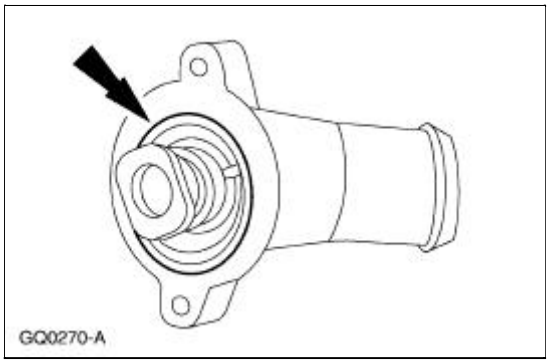
2. Disconnect the upper radiator hose from the coolant hose connection.



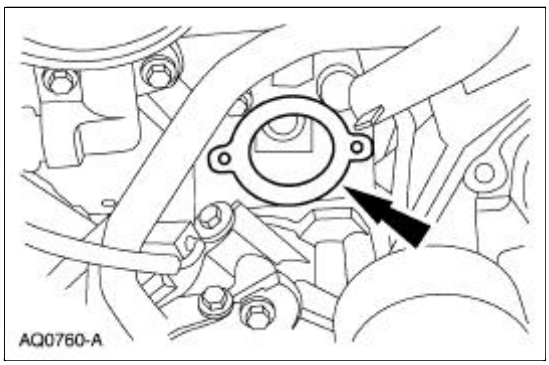

3. Remove the thermostat housing.
   - Remove the bolts.




4. Remove the thermostat.
   - Clean and inspect the water outlet connection.
   - Discard the thermostat gasket, and clean and inspect the mating surface.




5. Clean and inspect the thermostat mating surface at the engine.




6. **NOTE:** The thermostat is indexed and must be returned to the original location.

   **NOTE:** Coat the new thermostat gasket with gasket adhesive.

   **NOTE:** Make sure the new O-ring gasket is secure around the thermostat.

   To install, reverse the removal procedure.

7. Fill the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

# Thermostat —4.6L(2V)

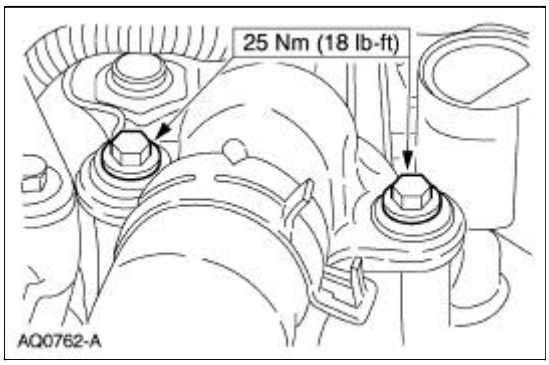
**Material**

| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

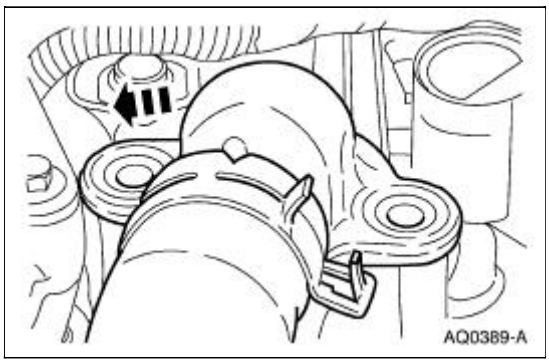
**Removal and Installation**

1. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

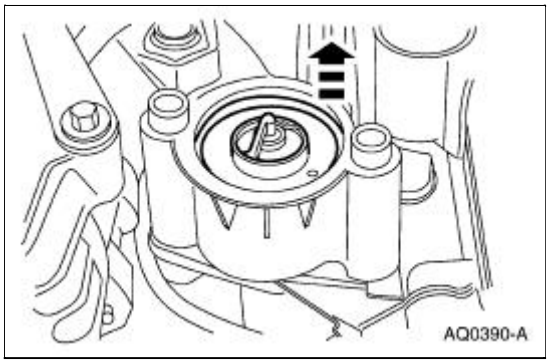
2. Remove the bolts and coolant outlet connection.




3. Position aside the coolant outlet connection and the upper radiator hose.




4. Remove the thermostat and O-ring seal from the upper intake manifold.
   - Inspect the O-ring seal. Install a new seal if necessary.




5. To install, reverse the removal procedure.

# Thermostat —4.6L(4V)

**Material**

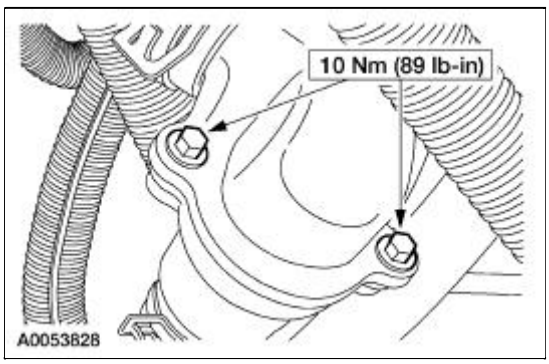
| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

**Removal and Installation**

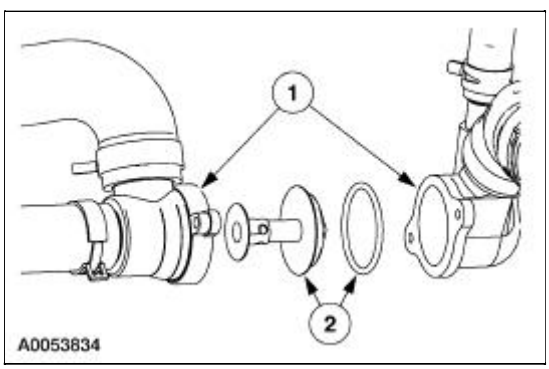
1. With the vehicle in neutral, position it on a hoist. For additional information, refer to Section 100-02 .

2. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

3. Remove the thermostat housing bolts.




4. Remove the coolant thermostat.
   1. Separate the thermostat housing.
   2. Remove the coolant thermostat and the O-ring seal.
      - Inspect the O-ring seal. Install a new seal, if necessary.




5. **NOTE:** The thermostat is indexed and must be returned to the original location.

   **NOTE:** Make sure the new O-ring seal is secure around the thermostat.

To install, reverse the removal procedure.

6. Fill the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

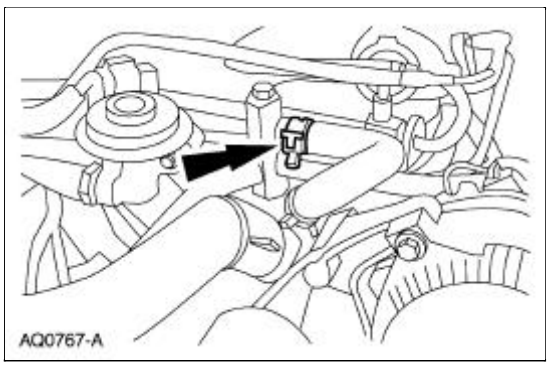
# Bypass Tube —3.8L

**Material**

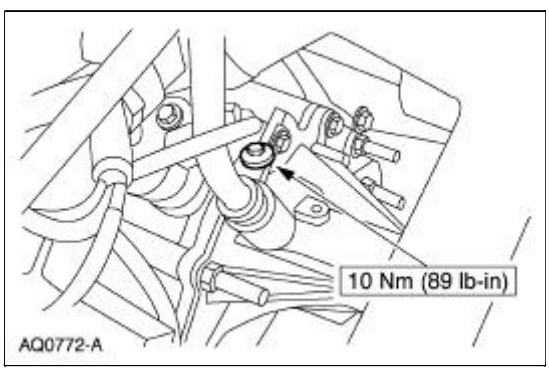
| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

**Removal and Installation**

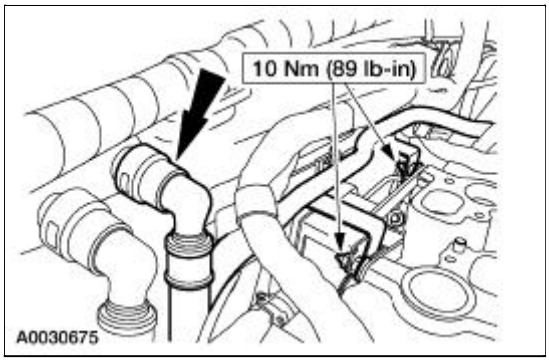
1. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.
2. Remove the upper intake manifold. For additional information, refer to Section 303-01A .
3. Remove the bypass hose from the bypass tube.



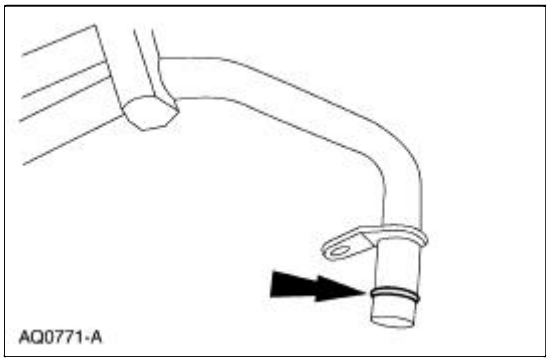

4. Remove the bolt and remove the bypass tube from the coolant pump.




5. Disconnect the quick connect fitting and remove the bracket bolts and the bypass tube.



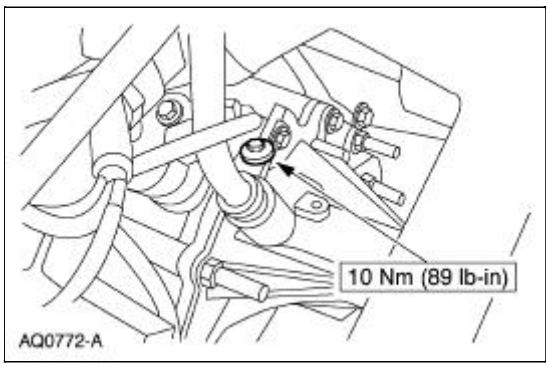

6. Install a new O-ring seal on the coolant bypass tube.




7. **CAUTION: Do not cut the O-ring seal during tube installation or engine coolant leakage may occur.**

   Clean the O-ring sealing surface on the cylinder heads and lubricate the O-ring seal. Use premium engine coolant.

8. To install, reverse the removal procedure.



# Bypass Tube —Cobra

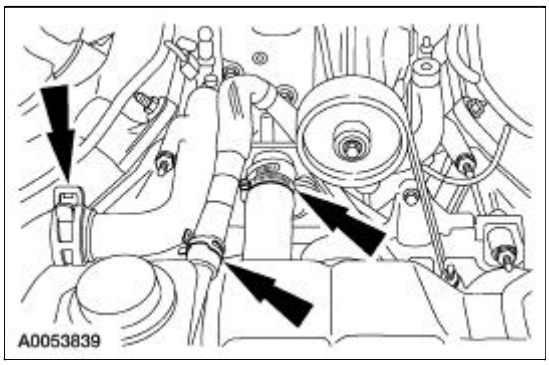
**Material**

| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

**Removal and Installation**

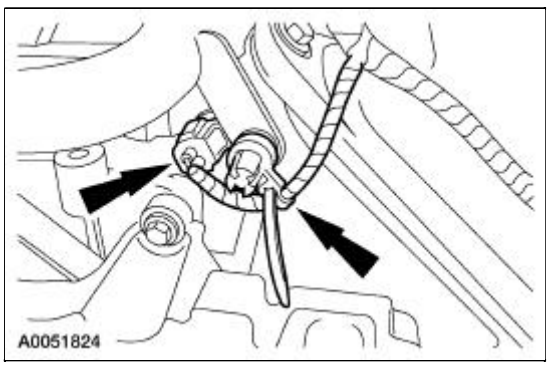
1. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. Disconnect the radiator upper hose and the radiator lower hose.



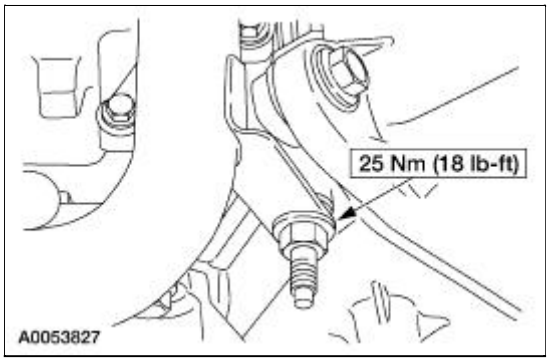

3. Remove the supercharger belt. For additional information, refer to Section 303-05 .

4. Disconnect the engine coolant temperature sensor electrical connector and unclip the wiring harness from the stud.



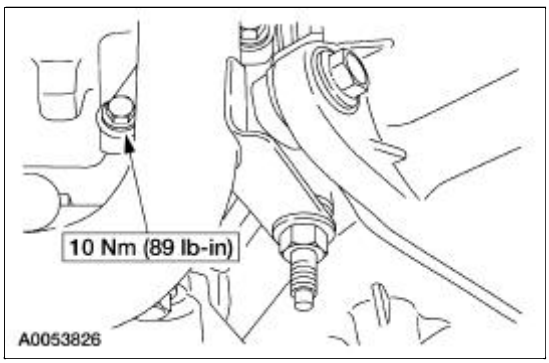

5. **NOTE:** LH is shown, RH is similar.

   Remove the coolant bypass nuts.




6. **NOTE:** LH is shown, RH is similar.

   Remove the bolts and the coolant bypass tube.




7. **NOTE:** Install new bypass tube O-rings and lubricate them, using premium engine coolant.

   To install, reverse the removal procedure.

8. Fill and bleed the engine cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

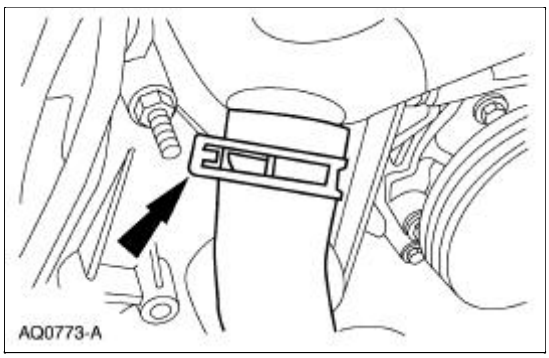
# Bypass Tube —Mach I

**Material**

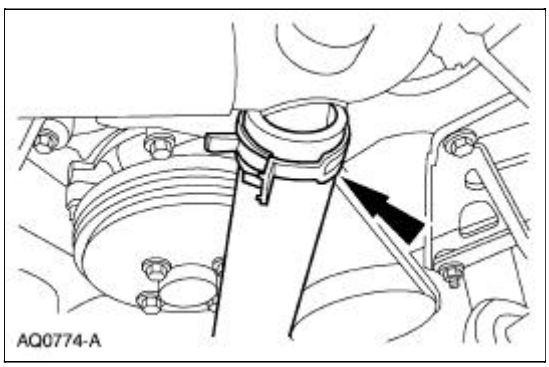
| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

**Removal and Installation**

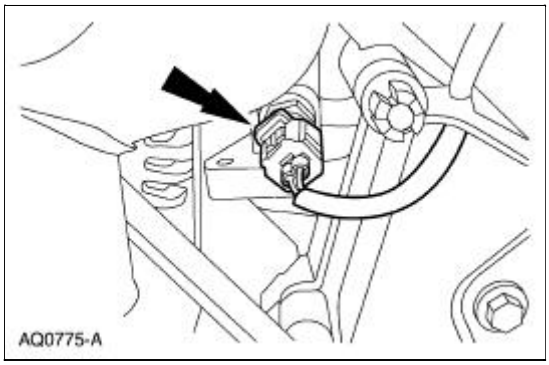
1. Remove the air intake scoop and bracket. For additional information, refer to Section 303-12 .
2. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.
3. Disconnect the upper radiator hose from the bypass tube.



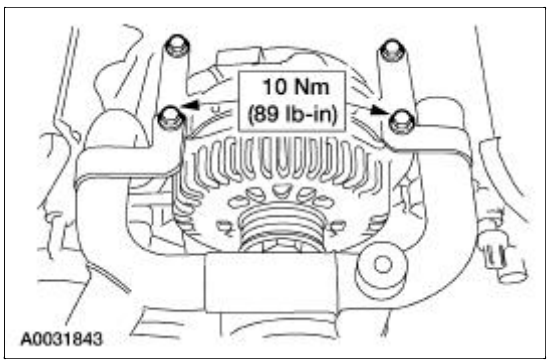

4. Disconnect the lower radiator hose.




5. Disconnect the engine temperature control (ECT) sensor electrical connector.




6. Remove the bolts and the bypass tube.




7. **NOTE:** Do not cut the O-ring seal during tube installation into cylinder heads or engine coolant leakage may occur.

   **NOTE:** Wipe the O-ring sealing surface on the cylinder heads with a soft cloth, if necessary and lubricate the O-ring seal. Use premium engine coolant.

   To install, reverse the removal procedure

8. Fill the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

# Water Pump —3.8L

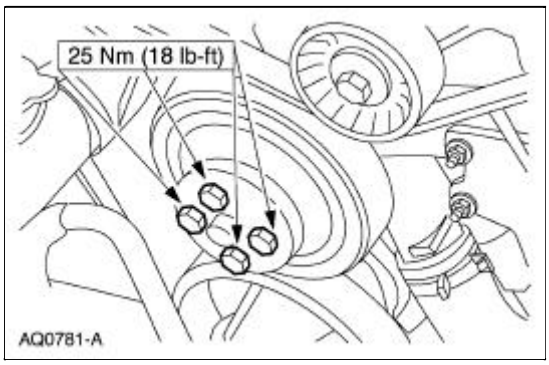
**Material**

| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

**Removal and Installation**

1. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

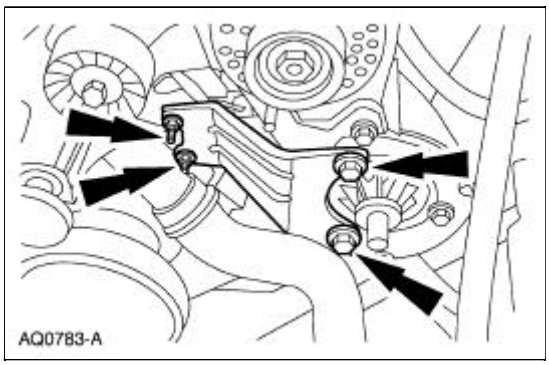
2. Loosen the coolant pump pulley bolts.



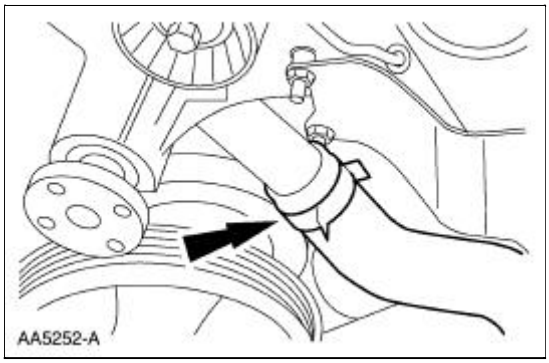

3. Remove the power steering (PS) pump pulley. For additional information, refer to Section 211-02 .

4. Remove the bolts and the coolant pump pulley.

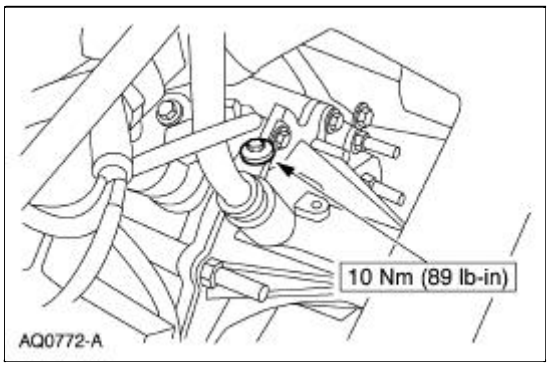
5. Remove the PS bracket.
   - Remove the bolts.
   - Remove the nuts.



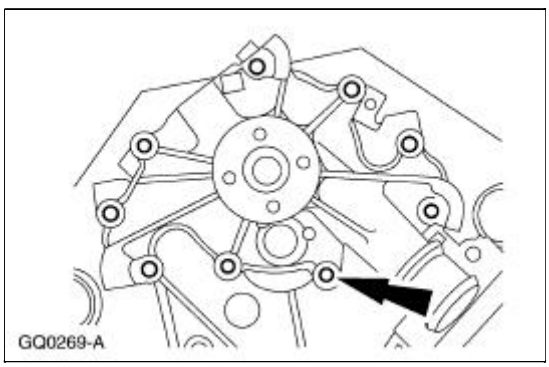

6. Disconnect the lower radiator hose from the coolant pump.



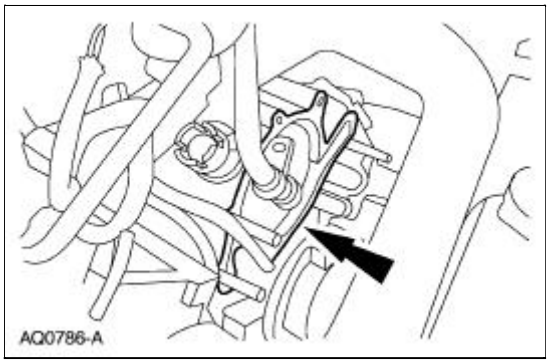

7. Position aside the coolant heater outlet tube assembly.
    - Remove the bolt.



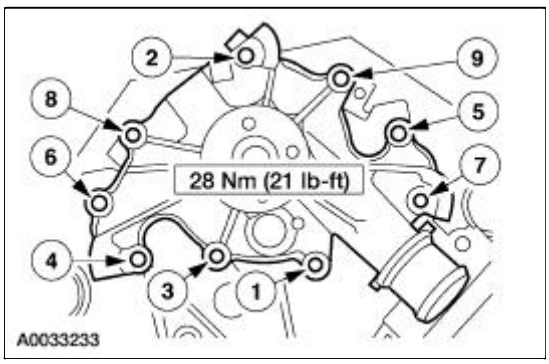

8. Remove the coolant pump.
    - Remove the stud.
    - Remove the four bolts.
    - Remove the four nuts.




9. Clean and inspect the gasket sealing surfaces.




10. To install, reverse the removal procedure.
    - Install a new gasket.
    - Tighten the coolant pump stud, bolts and nuts in the sequence shown.




11. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

# Water Pump —4.6L(2V) and 4.6L(4V)

**Material**

| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

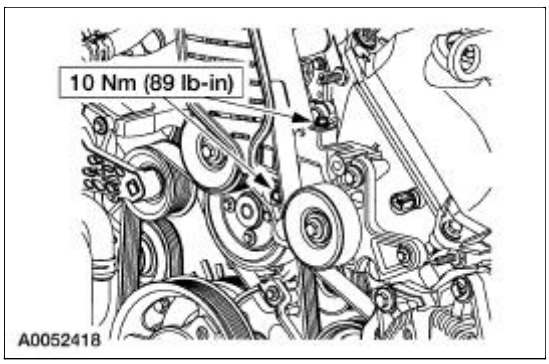
**Removal and Installation**

**Mach I**

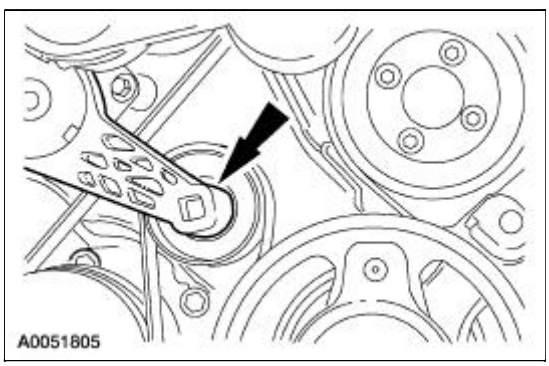
1. Remove the air intake scoop. For additional information, refer to Section 303-12 .

**Cobra**

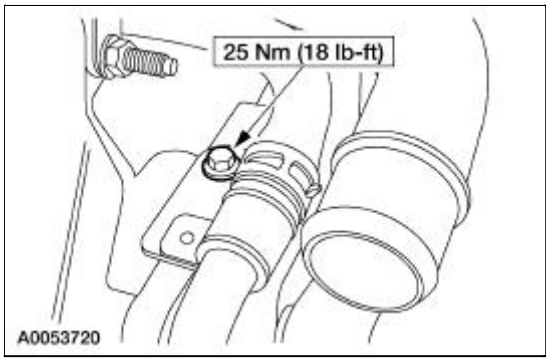
2. Remove the supercharger drive belt cover.



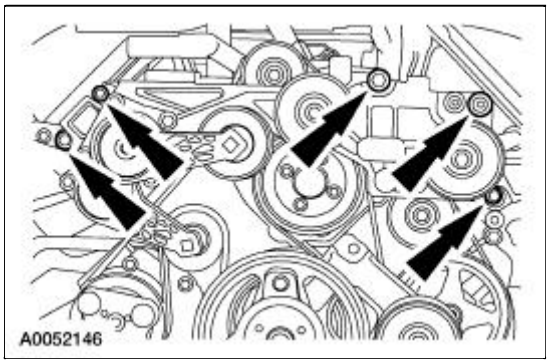

3. Rotate the supercharger belt tensioner clockwise and remove the supercharger drive belt.




4. Remove the coolant hose mounting bolt.



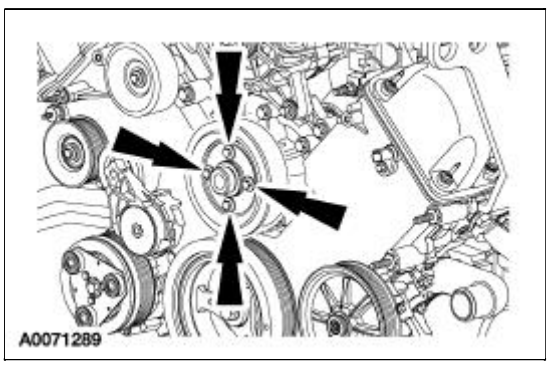

5. Remove the belt idler bracket support assembly.




**All vehicles**

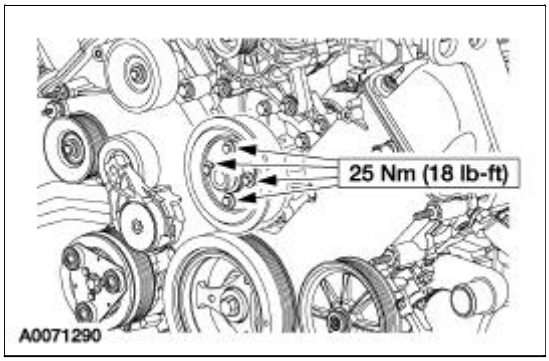
6. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

7. Loosen the coolant pump pulley bolts.

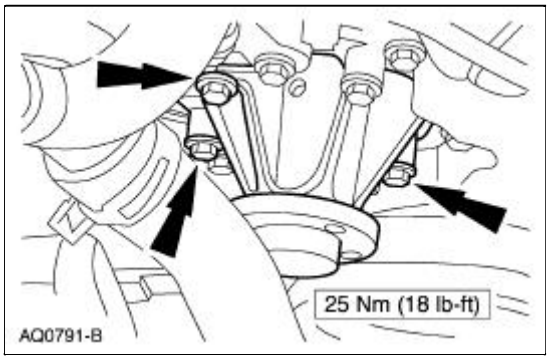



8. Remove the accessory drive belt. For additional information, refer to Section 303-05 .

9. Remove the bolts and the coolant pump pulley.




10. Remove the four bolts and the coolant pump.




11. If necessary, wipe the coolant pump mounting surface with a soft cloth.

12. **CAUTION: Do not rotate the coolant pump housing once installed in the engine. Damage to the O-ring seal can occur, causing the coolant pump to leak.**

    **NOTE:** Install a new O-ring seal and lubricate with the same clean engine coolant that is present in the system. Do not mix coolant types.

    To install, reverse the removal procedure.

# Radiator

**Material**

| Item | Specification |
|---|---|
| Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) (yellow color) | WSS-M97B51-A1 |

**Removal and Installation**

**NOTE:** Radiator removal and installation is similar for both 3.8L and 4.6L vehicles. The art shown in the procedure is the 4.6L engine.

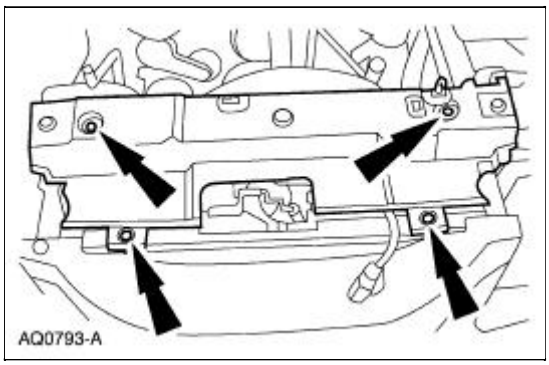
**Mach I**

1. Remove the air intake scoop. For additional information, refer to Section 303-12 .

**All vehicles**

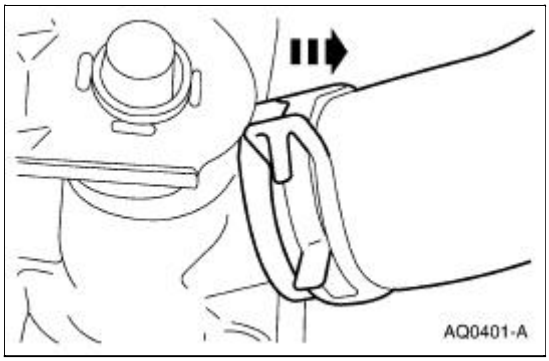
2. Drain the engine cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

3. Remove the radiator sight shield.
   - Release the clips.



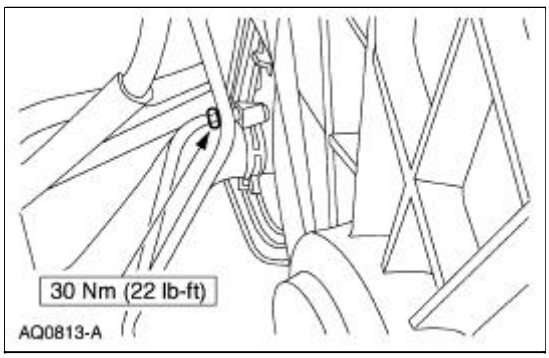

4. Remove the fan blade, fan motor and fan shroud assembly. For additional information, refer to Cooling Fan Motor and Shroud in this section.

5. Remove the upper radiator hose from the radiator.



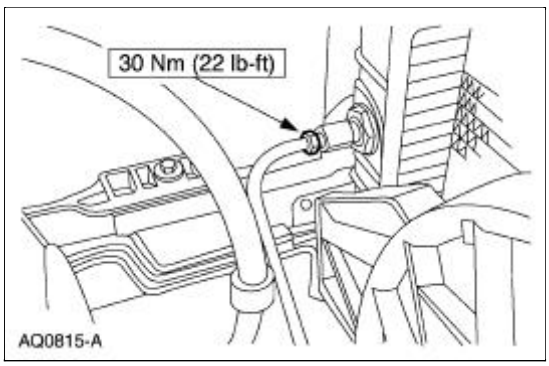

6. **NOTE:** To avoid disturbing the transmission oil cooler fittings, use a backup wrench.

   If equipped, remove the transmission lower cooler tube fitting.

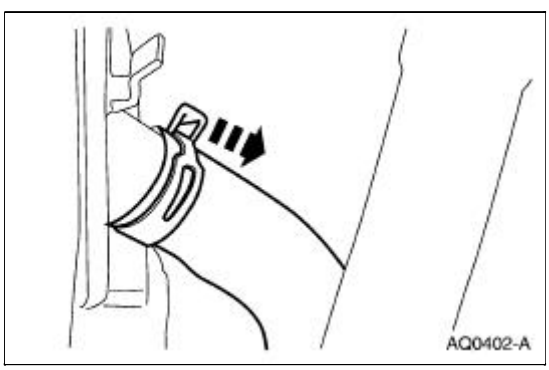



7. **NOTE:** To avoid disturbing the transmission oil cooler fittings, use a backup wrench.

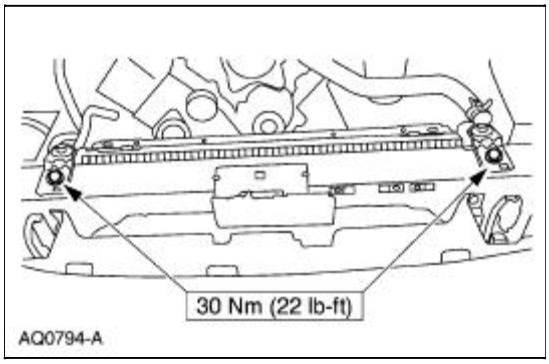
   If equipped, remove the upper transmission cooler tube fitting.



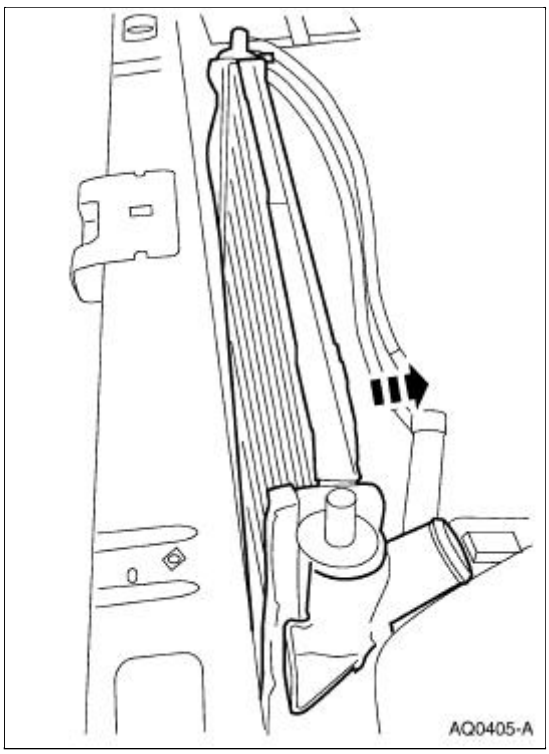

8. Remove the lower radiator hose from the radiator.



9. Remove the radiator supports.




10. Remove the radiator.




11. To install, reverse the removal procedure.

12. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

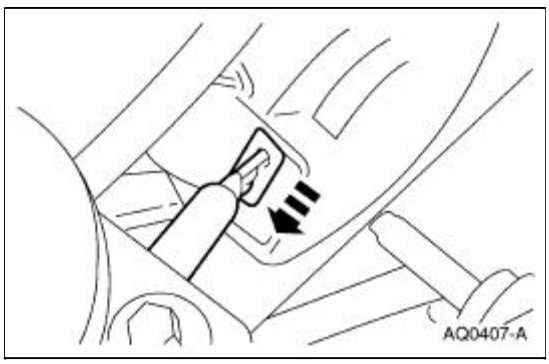
**Mach I**

13. Install the air intake scoop. For additional information, refer to Section 303-12 .

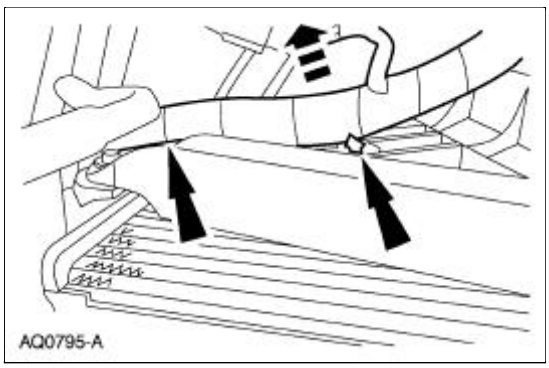
# Cooling Fan Motor and Shroud

**Removal and Installation**

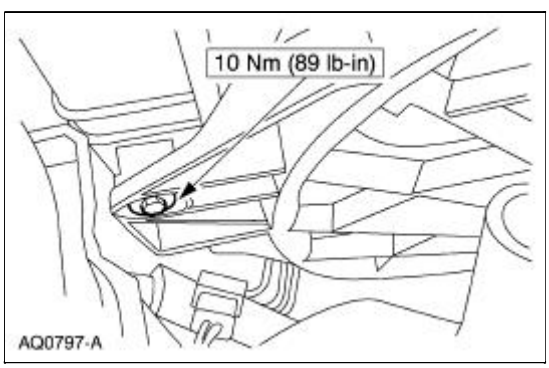
1. Disconnect the battery ground cable.
2. Remove the degas bottle or coolant expansion tank. For additional information, refer to Degas Bottle—4.6L(2V) and 4.6L(4V) in this section.
3. Disconnect the cooling fan electrical connector.



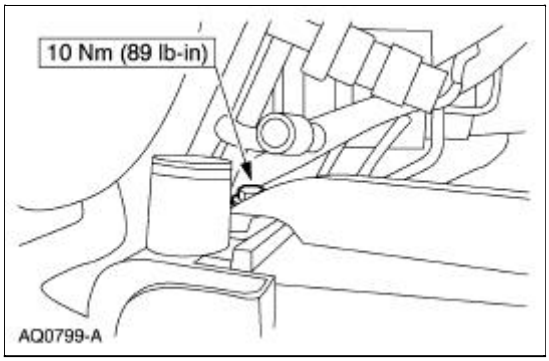

4. Separate the fan harness from the shroud.



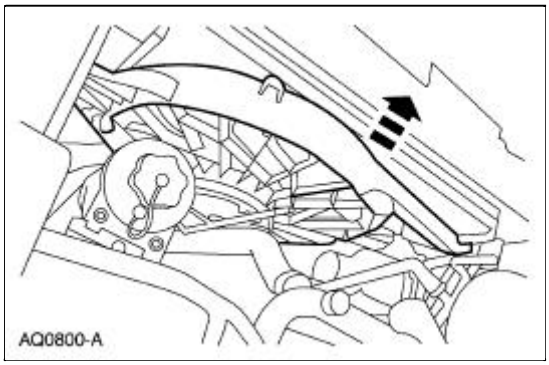

5. Remove the LH bolt.




6. Remove the RH bolt.




7. Remove the fan, motor and shroud.



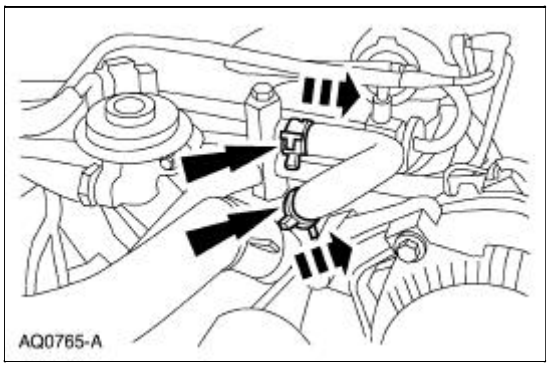

8. To install, reverse the removal procedure.

# Water Bypass Hose —3.8L

**Removal and Installation**

1. Drain the engine coolant. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. Remove the bypass hose.




3. To install, reverse the removal procedure.

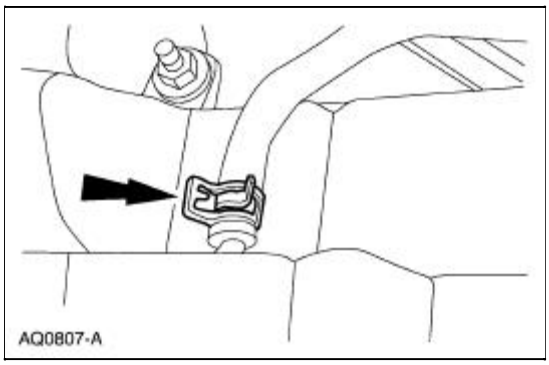
4. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

# Degas Bottle —4.6L(2V) and 4.6L(4V)

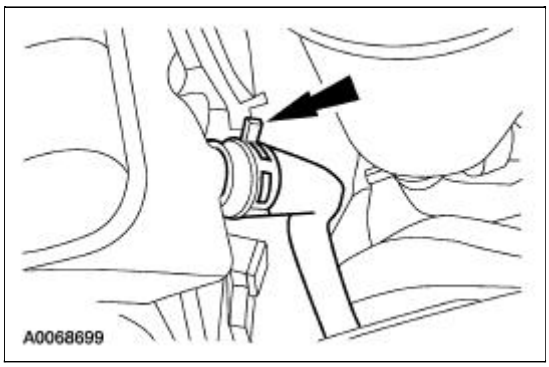
**Removal and Installation**

1. Drain the engine coolant from the degas bottle only. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

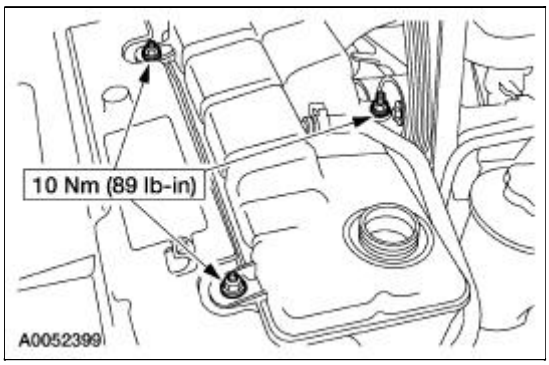
2. Disconnect the radiator vent hose.




3. Remove the degas bottle return hose.




4. Remove the nuts and the degas bottle.




5. To install, reverse the removal procedure.

6. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.